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ABSTRACT

Knowledge about ecological concepts, about wildlife and about endangered and threatened species was measured using over 1,300 eighth graders in Broward County, Florida. Knowledge scores were correlated with attitudes, non-consumptive attitude orientations, demographic characteristics, level of animal activities, and other variables. Study results indicate that knowledge plays a relatively minor role in predicting attitudes. Level of knowledge was significantly related to 16 of 25 attitude items. Associations were weak, indicating that other factors may be more important determinates of attitude. Nonconsumptive users of wildlife greatly outnumber consumptive users and were more knowledgeable. Sex, race, and parental education were the most important demographic predictors of knowledge. Urban, rural, and suburban differences appeared to be significant, but this finding was complicated by a low frequency of rural residents in the population. Parental association with an animal or wildlife-oriented organization was not significantly related to knowledge level. Participation in animal-related activities showed the highest association with knowledge of any of the variables examined. Level of participation was correlated with 18 of 25 attitude items but the correlations were weak. Knowledge level was not associated with the frequency of consumptive activities like hunting and fishing. These were the only animal activities that were not significantly correlated with knowledge. (Author/BB)

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The Influence of Knowledge on Young People's Perceptions about Wildlife

DAVID E. LaHART, Ph.D.

SE 027 674

FINAL PROJECT REPORT

TO

THE NATIONAL WILDLIFE FEDERATION

The Influence of Knowledge on Young People's Perceptions About Wildlife

by
David E. LaHart, Ph.D.
Research Associate

June, 1978
Tallahassee, Florida

Environmental Education Project
College of Education
Florida State University

Abstract

THE INFLUENCE OF KNOWLEDGE ON YOUNG PEOPLE'S PERCEPTIONS ABOUT WILDLIFE

David E. LaHart, Ph.D.
The Florida State University, 1978

Knowledge and attitudes are major components of environmental perception and are important influences on each other. Knowledge about ecological concepts, knowledge about wildlife and knowledge about endangered and threatened species were measured using over 1,300 eighth graders in Broward County, Florida. Knowledge scores were correlated with attitudes, non-consumptive attitude orientations, demographic characteristics, level of animal activities, and other variables.

A model for examining environmental perception was developed and used to organize various components of this study. The model proved useful as a scheme for perceptual research.

Study results indicate that knowledge plays a relatively minor role in predicting attitudes. Level of knowledge was significantly related to 16 of 25 attitude items, but the associations were weak indicating that other factors may be more important determinates of attitude. Non-consumptive users of wildlife greatly outnumber consumptive

users and were more knowledgeable.

Sex, race, and parental education were the most important demographic predictors of knowledge. Urban, rural, and suburban differences appear to be significant, but this finding is complicated by a low frequency of rural residents in the population. Parental association with an animal or wildlife-oriented organization was not significantly related to knowledge level.

Participation in animal-related activities showed the highest association with knowledge of any of the variables examined. Level of participation was correlated with 18 of 25 attitude items but the correlations were weak. Knowledge level was not associated with the frequency of consumptive activities like hunting and fishing. These were the only animal activities that were not significantly correlated with knowledge.

The effects of increasing knowledge on attitudes remains unclear because of the small knowledge increases in the experimental group and the lack of a functional control.

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Dr. Paul Bethune and Nancy Taylor helped facilitate this study with the Broward County School Board; Carol Houck reviewed the research instrument for readability. Cooperating teachers Leta Pelczar and Arlee Pollard contributed both their time and their classes. The staff of the Office of Environmental Education, especially C. Richard Tillis, James Phillips, and Rebecca Dickey, helped open many doors through the Department of Education.

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CHAPTER I

INTRODUCTION

A major outgrowth of the environmental movement has been a renewed interest in the plight of endangered and threatened species of wildlife. This interest has spawned a plethora of magazines, books, and elaborate learning materials designed to increase public consciousness about endangered species and to educate both children and adults about the need for their conservation and preservation.

The term "endangered" includes any species which is in danger of extinction throughout all or a significant portion of its range. Threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of its range. While the concepts of endangered and threatened species involve both animals and plants, this discussion will focus only on wild animal life.

In the past, state and federal agencies charged with educational responsibilities have responded by providing generalized information in the form of written materials,

canned slide/tape programs, and costly movie productions aimed at the public-at-large. Little or no audience research was done before these massive information-disseminating campaigns were thrust upon the public.

This is especially true of programs currently being designed to "educate" the public about endangered and threatened species. To begin an effective program of educational intervention, it is necessary to know the needs of the various target populations within the program. Despite the many dollars allocated for programs, little effort has been spent identifying needs and less effort has been spent evaluating the overall effects of such programs.

Research, to date, has concentrated on persons over 18 years old, and the largest body of research has been on hunters--a group that makes up less than 15% of the overall American population. Research on young people's perception of wildlife is lacking entirely. Currently, most programs are designed to increase knowledge as a means of increasing personal awareness and commitment to the preservation of wildlife. While the goal of increasing knowledge is an admirable one, there is conflicting research about the interrelationships between knowledge, attitudes, and commitment.

Iverson (1975) found that college students who were

more knowledgeable about environmental problems were not significantly more concerned about the problems than students with average environmental knowledge. If this can be generalized to wildlife, people concerned with environmental education, conservation of wildlife resources, and the protection and management of endangered species of wildlife may well be designing programs that lack a sound research base. Iverson's conclusion is supported by Maloney and Ward (1973), who compared members of the Sierra Club, college graduates, and non-college graduates on four scores including knowledge about environmental problems. Here, knowledge did not correlate significantly with any of the other three scales (verbal commitment, actual commitment, or an individual's emotionality). Dispoto (1977) examined moral values and environmental variables including activities, emotions and knowledge, and concluded that environmental knowledge was a powerful predictor of environmental activities, but there was no relationship between knowledge and moral valuing.

Research in environmental perception by geographers, psychologists, and educators use a variety of research instruments like questionnaires, opinionnaires, and personal interviews. The research audience has, to a large degree,

been college students enrolled in geography, psychology, or education. There is an increasing number of studies which attempt to determine the extent of differences between resource managers and the using public. All these studies are designed to measure--to collect enough data to be able to classify--a particular population according to its perceptions of various issues. There have been no serious attempts to change attitudes or perceptions toward natural resource issues.

Because the role of knowledge about the environment is vague and the relationship of knowledge and attitudes is unclear, the purpose of this research was to examine: (a) knowledge, animal-related activities, and attitudes about wildlife as components of environmental perception; (b) the relationship between knowledge and animal activities with consumptive and non-consumptive orientations; (c) demographic factors as possible influences on knowledge and perception of wildlife and endangered and threatened species; (d) the relationship of animal-related activities and knowledge; (e) the relationship of knowledge with attitude towards hunting; and (f) the effects of increasing learner knowledge about wildlife and endangered species on perceptions.

CHAPTER II

REVIEW OF THE LITERATURE

Perception and environmental perception have been favorite research topics of geographers, psychologists, and educators in recent years. Since the scope of environmental perception seems to vary among these academic disciplines, this literature review is organized around the disciplines of particular interest to this study to provide an overview of environmental perception.

Literature in Geography

Perhaps Tuan (1967) summarizes the view of environmental perception for many geographers when he notes that: "Nature is recognized, on the one hand, in local objects--individual animals, plants, and rocky prominences. On the other hand, it is perceived as a generalized phenomena as sky, moon, water, light, and darkness" (p. 8). Geographers are quite capable of perceiving the environment on scales ranging from micro to the "world view."

A typical research problem in environmental perception may involve landscapes. For example, Zube (1974)

compared the use of descriptive terms for the landscape between two distinct professional populations. He surveyed environmental designers like landscape architects, planners, and architects, and compared them to resource managers like foresters, wildlife managers, and soil scientists. A semantic differential scale was developed by a panel of experts, and the two populations were asked to use the scale in their descriptions of photographs and topographic maps. He found a reasonable level of agreement between the two populations.

Another favored research area is wilderness. Hendee, Calton, Marlow, and Brockmar (1968) examined the demographic characteristics of wilderness users and looked at their values and management preferences in the Northwest. They found that the management preference varied with the particular type of recreation the wilderness users preferred.

The Boundary Waters Canoe Area (BWCA) in the North Central states has received a considerable amount of research. Peterson (1974a) evaluated BWCA users' perceptions of a wilderness experience with their actual experience. This study used psychological inventories to measure aspirations for, and perceptions of, a spectrum of specific details of the wilderness experience. Comparing aspirations and

perceptions allows (1) the development of an overall index of quality (satisfaction), and (2) the identification of specific sources of satisfaction and dissatisfaction and the measures of the relative contribution of each. Peterson used a questionnaire containing an inventory of 90 conditions that might influence satisfaction if encountered in the wilderness. Ten major categories were developed and a Likert-type scale, ranging from undesirable through neutral to desirable, was developed. Persons were asked how common these conditions were in the wilderness. The measure of average perceived commonness became an estimate of perception for the sample of wilderness users (canoeists).

In a follow-up study, Peterson (1974b) compared the perceptions of wilderness managers and wilderness users. The questions being addressed were whether, and to what extent and in what respects, the managers and users differ in their attitudes, preferences, and perceptions concerning the BWCA. Peterson discovered that the populations differed in many important details, including the amount of development each would tolerate in wild areas. While the study severely suffers from sampling problems, it does provide a useful insight into the relative differences in the perceptions of wilderness between the agencies that manage the

wilderness areas and some of the people who use the wilderness. There are several studies that compare different professional groups like engineers and public health officials (Sewell, 1971) or students, conservationists, and professionals (Willhite, Bowlus & Tarbet, 1973).

Barker's (1975) research on the conceptualization of air pollution by specialist groups represents a blend of the psychological research with that of the geographers. Barker incorporated the framework of cognitive theory and methodology to study a variety of environmental management issues examining how people perceive highly complex and often inconsistent information under conditions of uncertainty. This approach attempts to describe efforts to conceptualize the human environment: the way in which people perceive, interpret, and transform stimuli in relation to preexisting cognitive organization (knowledge). The research is concerned with the process of how a person thinks rather than <u>what</u> is thought. The mediating process becomes the structures between the stimuli (environment) and actual behavior. A person is seen not as a passive agent but rather as an individual who perceives and modifies stimuli. Internal evaluative tendencies or perceptions develop and serve as connecting ties between the person and the external

world.

In a review article, Kameron (1973) examined the notion of "geographic perception" as the way in which individuals perceive the world--how they form their world view. The general conclusion of this research review is that a person's world view is a result of the "real world" and attitudes, beliefs, and experiences. Knowledge was not considered as an independent variable. Research into human perception about wilderness typifies the "world view" geographer.

Another major research thrust concerns the perception of natural environments on a smaller scale. Shafer (1969) reviewed research and theories of natural environmental perception and also reported his own studies on subjects' perceptions of campsites. He stressed the role of individual needs and values in determining preferences for certain types of campsites. Craik (1976) has proposed a research paradigm for the study of human responsiveness to landscape. It takes into consideration mode of presentation, response format, observer characteristics, and description of the environment used. Lowenthal (1966, 1967) also discussed Americans' attitudes and perceptions of landscape and their values concerning it.

Sonnenfeld (1969) hypothesizes that populations occupying different environments will not differ in their perception of contextual elements of their environments, but will differ in their perception of focal elements. Data from Delaware and Alaska have generally supported these predictions. However, personality variables have been implicated as a possible source of "within population" differences. Sonnenfeld (1967) has also compared several distinctive populations in their preferences for relief, vegetation, water, and temperature.

Sonnenfeld (1972) carefully attempts to bridge the apparent gap between psychology and geography by developing a model of environmental personality and behavior. The model brings together a variety of elements that may account for variability in environmental behavior. These include the stimulus situation and personality variables grouped into categories of awareness, operational style, style of action/reaction and motivation. By holding the stimulus constant, one can explain variation in environmental behavior in terms of critical personality dimensions, which are specific neither to culture nor to the environment. Interestingly enough, Sonnelfeld does not include knowledge in his model.

Lowenthal's (1972) review of research in environmental perception provides an indepth framework pointing out existing needs. He clearly identifies the problems of scope and definition. Although Lowenthal makes no attempt to define the terms in his review, he claims that research in perception and behavior frequently concentrate on one particular parameter of human response--environmental preference, environmental judgment, environmental disposition, environmental behavior--in one particular experiential mode. He makes an eloquent plea to develop understandings of cultural and natural linkages to holistically cope with environmental perceptions and actions.

The literature indicates that perceptions are linked closely to values. But even when people perceive objects or phenomena similarly, they may differ in the values they assign to them or the preferences they express for them. People differ not only in what they value and prefer, but also with respect to the goals they establish. The goal of one group may be the preservation of an endangered species; of another, to return that species to a population level where it can be harvested.

Psychologists and Environmental Perception

There are many references to various types of perceptions in the psychological literature. Environmental perception is being researched to explain the interrelationships of beliefs, behaviors, attitudes, perceptions, cognition, personality, self-image, self-esteem, and an abundance of other psychological variables.

Bruvold (1973) experimentally examined belief and behavior as determinants of environmental attitudes. This study focused on behavioral responses to water reclaimed from domestic sewage. Both belief and behavior indices were found to correlate significantly with attitude. Further, the multiple correlation, with attitude as the dependent variable, was significantly stronger than either first-order relationship. Unfortunately, the study did not attempt to assess environmental knowledge or understanding of the water-purification process.

Arbuthnot (1977) explored the roles of attitudinal and personality variables in the prediction of environmental behaviors and knowledge. A survey designed to assess environmental behavior, attitudes, and knowledge, as well as several personality dimensions, was administered to two

diverse samples--85 users of a recycling center and 60 conservative church members. The two samples differed, as predicted, on behavior, attitude, knowledge, and personality characteristics. A stepwise, multiple-regression analysis revealed that education, knowledge, and attitudes were the best ways to predict recycling behavior while exposure to information through books, personality, and attitudes best predict environmental knowledge. Formal education was not a good predictor of environmental knowledge.

Psychologists have entered the domain of the geographer and begun to explore some of the psychological aspects of man-environmental relationships. For example, Haberlein (1972) searched for psychological reasons for changing environmental attitudes. Humankind was viewed as part of nature--inextricably related to the natural world. When humans are perceived as part of the natural world, they are diminished when it is disrupted. Under a strict economic orientation, the adverse effects of environmental degradation on humans, present or future, have little weight in the decision-making process. By eliminating the human-nature distinction, it is assumed that humankind is injured when the integrity, stability, or the beauty of the biotic community is disrupted, whether from oil spills, carbon

dioxide increases in the atmosphere, or sanitary landfills. The real or potential threats of any decision that affects the biotic community affects the human community and are as important as economic efficiency. Leopold (1933) identified this change as a change from the economic to the ethical: making decisions concerning the natural environment on the basis of morality rather than economics. This perception of humankind/environment is reinforced by moral theorists like Schwartz (1968) who found moral norms were an important influence on environmental behavior.

Rossman and Ulehla (1977) tried to compare the psychological reward values associated with wilderness use. They looked at the environment as a treatment for obtaining valued goals or reinforcers. Wilderness was considered as an instrument for gaining reinforcers like solitude or contact with nature. The authors constructed a questionnaire after informal interviews with "users" to obtain a list of wilderness rewards. The questionnaire was administered to students in a college introductory psychology course who ranked the wilderness rewards.

Schmidt and Buys (1974) studied the attitudes of technological students in attempting to assess their perception of the severity, causes, and solutions to environmental

problems as well as their personal commitment to their solutions. The subjects who perceived the problems as severe were more personally committed to the solutions than those who perceived the problems as institutional.

Psychologists have viewed environmental perception as part of an individual's internal organization of external stimuli. Beliefs, attitudes, behavior, values, personality variables, demographic factors, and knowledge are factors examined by psychologists involved with environmental perception. The research indicates that all these factors influence perception, but their relative importance and the manner in which they interact remain unclear.

Educators and Environmental Perception

Educators have also been investigating the interrelationships between people and the environment. Iverson (1975) developed an analysis of the interrelationship of environmental knowledge and environmental concern. Using the Syracuse Environmental Awareness Test (Forms A and D), he discovered that the more knowledgeable students were not significantly more concerned than the average student about environmental problems. He found no evidence to indicate there was any cause-effect relationship. Alvord (1972)

concluded that just as students cannot be expected to do better academically when we teach attitudes, neither can students be expected to learn new environmental attitudes merely as by-products of academic teaching. In fact, Quinn (1976) found that if teachers make an effort to teach attitudes, student attitudes toward environmental problems could be modified. These studies point to the importance of teaching both academic information and the values involved with environmental decisions.

Hyde (1976) studied teachers' perceptions about environmental issues and problems in three areas: the role of the school, the role of the teacher, and the teacher's classroom treatment of environmental issues. This essentially was a comparison of: should schools teach environmental education, who (what discipline) should teach it, and who does teach it. Using a questionnaire with 94 issues arranged into the seven categories identified in the Environmental Education Act of 1973, Hyde concluded that secondary school teachers recognized the need for environmental education, but science and social studies teachers did most of the environmental instruction. Foerstel (1976) went a step further in developing an analysis of the congruence among students, parents, teachers, and

environmentalists about their perceptions of and solutions to environmental problems. Little agreement was found in the overall ranking of environmental problems among the various groups. Interestingly enough, there was a high agreement on how to solve both long-term and short-term problems.

Educators are beginning to look to the expanding field of environmental perception as a holistic approach to environmental education; however, developmental research in environmental perception and methods of changing perception is lacking.

Perceptions of Animals

Bart's (1972) study of a hierarchy among attitudes toward animals introduced a simple mechanism for measuring the strength of "like" and "dislike" attitudes for 30 species of animals including several endangered species. By using "tree theory," a type of path analysis, to order the attitudes, Bart identified the relationship among the animals studied.

> It is interesting to note the low rankings and the low percentages of positive responses to the various animals that are rare and endangered

> species such as the alligator, wolf, falcon, hawk, and vulture. Those indices provide evidence to support the contention that, even among college students, there is substantial disdain and dislike for animals that are rare and endangered. (p. 6)

Whether Bart's data supports this statement or not is open to question and certainly in need of more research. Many well-known animals that students could have had personal contact with (such as dogs and cats) were included in the list. This may have influenced their ranking.

LaHart and Tillis (1974) used a process similar to Bart's to develop a hierarchy of attitudes toward endangered species. The specific need in this case was to develop psychological sequences to organize learning experiences as part of a simulation game involving endangered species. A "like-dislike-don't know" semantic scale was used on three different groups. Their results indicated that the learning sequences should be organized in a different pattern for school children than for college students or school administrative personnel.

Perhaps the most significant research on animals and humans has been done by Kellert (1976, 1977). As a

result of a national survey, which included interviews with over 550 people from five different geographic areas of the United States, Kellert (1976) was able to identify a typology of attitudes toward animals. Nine basic attitudes were identified and labeled as naturalistic, ecologistic, humanistic, moralistic, scientistic, aesthetic, utilitarian, doministic, and negativistic attitudes. Attitudes toward animals and characteristics of various groups that interact with animals were also examined. Attitudes were broadly defined as a distinguishable pattern of related ideas (cognitive notions), feelings (emotional-affective notions), and beliefs (cultural value notions).

Sex and education were the most consistent social differentiators of people's views toward animals. Due to the linkages of education with socioeconomic factors, the exact role of formal education could not be determined; however, education appeared to be related far more to a positive outlook and feelings for animals than differences in wealth. This suggests the potentially important impact of education on the development of concern and affection for animals.

High interest in wildlife and pets during childhood were both excellent predictors of high schools on the animal

knowledge test section of the interviews. Predictably, formal education was also a significant factor.

Kellert's findings suggest that concern for animals among the college educated was more typically directed at issues of natural habitat destruction and harm to wildlife species than at a concern about cruelty to animals. For those who believe that harm to natural habitats and wildlife species is more fundamental than the suffering of individual animals, this finding supports the impact of sophisticated environmental education programs. This is especially true for programs emphasizing wildlife and endangered and threatened species. Maintaining natural habitats is critical to the survival of many species.

Pomerantz (1977) used a mail-out questionnaire to 2,362 young people in grades 7 to 12. Grade levels, attitude groups, urban and rural differences, and sex were identified as important variables in predicting knowledge. Each successive grade between 7 and 12 had more students with high knowledge scores. A greater number of hunters than non-hunters had high knowledge scores, and more non-hunters had high scores than anti-hunters. Males and rural residents also scored higher on the knowledge portion of the questionnaire.

Correlation analysis was not done on the data so the relative importance of each of the variables is uncertain. However, the Pomerantz data can provide a comparison where it parallels this study.

McDonough (1975) attempted to measure the attitudes of North Central Florida residents toward wildlife resources. The research instrument was used both as a mail-out questionnaire and as an interview form. Few differences were found when the methods of data collection were compared. The knowledge portion of the research was based on responses to only five questions, and the results tend to support Kellert's (1976) findings, correlating knowledge and animal-related activities. In the McDonough study, 55% of the adult population had scores that fell into the low-knowledge category. Only 4% had scores in the high range. There was a significant relationship between hunting activities and knowledge level. Whereas 5% of hunters had scores in the high range, only 1% of the non-hunters and 3% of the anti-hunters had scores in this range. Anti-hunters and non-hunters predominated in the low-score range with 65% of non-hunters and 69% of anti-hunters scoring low, while only 46% of hunters scored in this range. There did not appear to be any significant association between knowledge level and wildlife-related values.

There seems to be a great deal of conflict in the literature about the role of knowledge and the attitude-belief-behavior-perception complex. Part of this problem stems from some researcher's equating knowledge and education. Another factor is the bewildering array of tests used to measure environmental knowledge and attitudes. Perhaps the greatest confusion lies within the vague concept of environmental perception. This concept is dependent on both environmental and individual psychological variables like beliefs, attitudes, knowledge, and personality factors. The relative importance of each of these factors is subject to considerable debate, and many of the terms are used interchangeably in the literature. There is general agreement that environmental perception is influenced by stimuli (the environment or a particular part of the environment) and by the psychological qualities within the individual. White (1966) identified perception as the individual organization of a sensory stimulation. Saarinen (1976) observed that "perception is generally concerned with the effects of social and cultural factors on our cognitive structuring of the physical and social environment" (p. 7). The concept has common factors including sensory experience, or stimuli, cognitive synthesis based on knowledge and

personality factors like self-image.

Saarinen (1976) identified a perceptual model for research into geographic space perception including perceptual receptors that selectively filter information from the environment. The model did not include internal mechanisms through which the individual could process stimuli except a value system. Eiss (1968) examined perception as a component of instructional systems and developed a model that emphasizes the individual's processing of stimuli. His model did not address decision making nor behaviors as components of environmental perception. Figure 1 represents a combination of the Saarinen and Eiss models and, for this study, will provide a functional definition of environmental perception.

The model presents a holistic approach for examining the components of environmental perception. For example, a stimulus generated by the environment is filtered through perceptual receptors and impacts upon the individual's cognitive, affective, and psychomotor systems. Individual processing of the information ultimately influences decision making and hence environmental behaviors. These actions provide an opportunity to gain new information and receive additional stimuli.

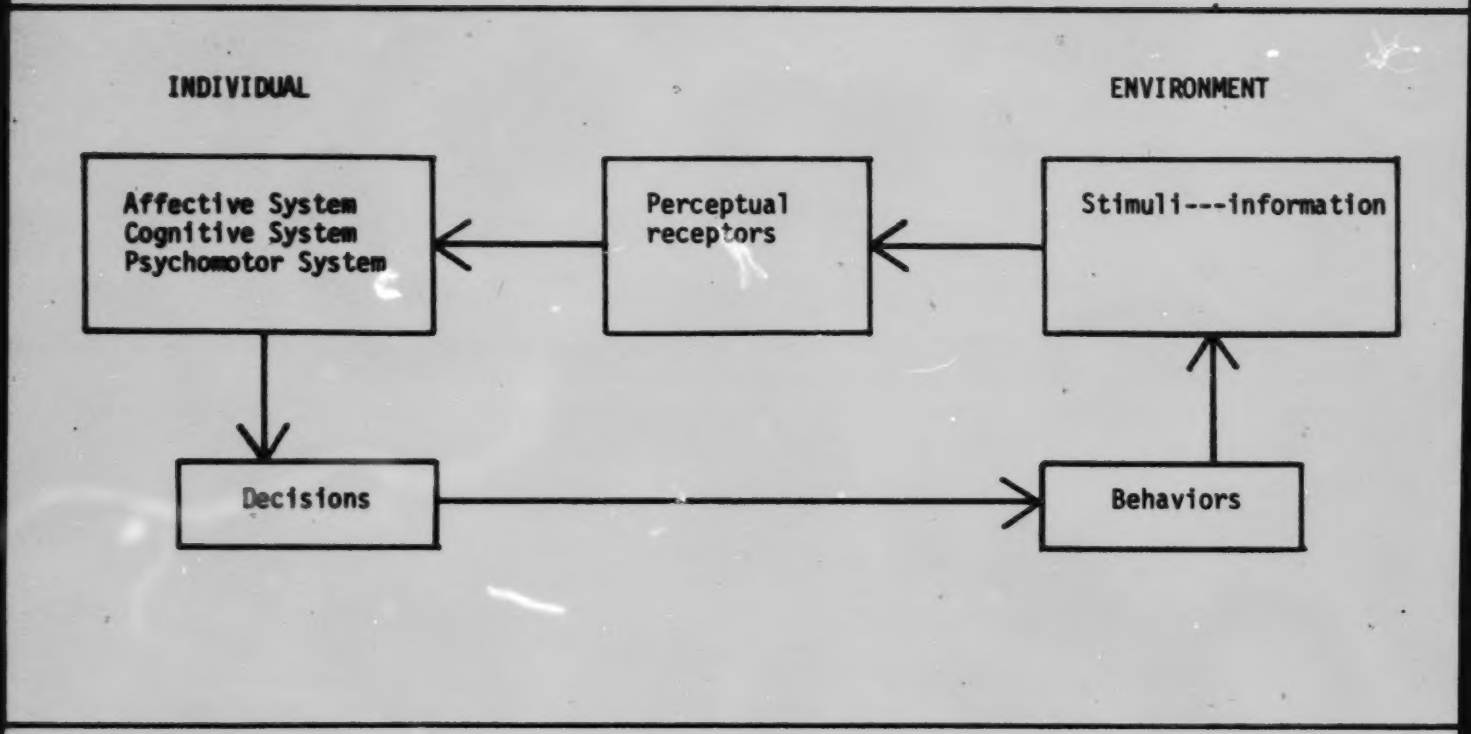

Figure 1. A conceptual scheme for research into environmental perception.

Means (1972) observed that planning changes in social behavior presupposes a hierarchical ordering of nature in terms of structure and functions. Humans have the ability to act on the basis of an integration of past experience--not just reacting to immediate stimuli. He makes the point that humankind cannot understand the complex organization or the environment by reducing it to elemental stages. Reductionism, as the dominant style for all rational, scientific thought, may be highly dogmatic and restrictive. Another mode of thought--perhaps termed "synthetic" or "composition"--is just as important to scientific understanding. The model in Figure 1 can provide a synthesis for compiling information about environmental perception.

The literature indicates that the topic of environmental perception has received different kinds of attention from different disciplines. The basic components of the perception model in Figure 1 are supported by an abundance of studies, but the influences of the components on each other remain unclear. The relationships within an individual's cognitive, affective and psychomotor systems are particularly confusing, and the focus of this research was to examine the influence of knowledge on environmental perceptions, especially attitudes.

CHAPTER III

STUDY DESIGN

Instrument Development

The primary research instrument for this study was a teacher-administered questionnaire designed to: (a) measure knowledge, animal-related activities and attitudes as components of environmental perception; (b) obtain data about attitudes toward hunting as well as consumptive and non-consumptive resource orientation, and (c) examine demographic variables as possible influences on perceptions.

The knowledge portion of the instrument was developed with the help of cooperating social studies and science teachers familiar with the environmental concepts middle school students study as part of their curriculum. The knowledge portion was divided into three components. The ecological knowledge component was modified from the Pomerantz (1977) study, reworded and designed to use examples of Florida's unique environmental systems. The knowledge of animals component included key questions from Kellert's (1976) study of adults. The questions were

substantially modified to ensure readability. The knowledge of endangered and threatened species component was unique to this research, and many of the questions were developed by the cooperating teachers.

Since attitudes encompass both feelings and beliefs, they have both affective and cognitive components. Feelings and beliefs are generally directed toward decision-making, and therefore are important elements of perception. For the purposes of this study, measuring attitudes was accomplished during Likert-type questions similar to those developed by Kellert (1977), who measured the attitudes of adult Americans toward animals. Questions about reasons for enjoying wildlife were used to determine consumptive and non-consumptive orientations. The frequency of animal-related activities and demographic items were used to obtain data on the possible influences of these variables on perceptions.

The draft instrument was examined by consultants involved in the Florida-wide eighth-grade assessment program, including persons working with attitude measurement and a reading specialist employed by the study site's school system. Recommended changes were incorporated into the instrument, and it was field tested on a population of 30 eighth grade students in Leon County, Florida. Discussions with

students after the field test indicated the students did not have problems with any of the items. Students indicated they enjoyed the experience because it forced them to make choices about things they rarely had thought about prior to this test. The field test data was tabulated, and the range of scores indicated there would be sufficient spread for data analysis.

Representatives from the Broward County, Florida, School Board also reviewed the instrument and recommended some changes. A copy of the final research instrument is included as Appendix 1.

Questions 1 through 11 were used to develop a score based on the number of animal-related activities in which young people had been involved the previous year. Questions 12 through 22 determined the resource orientation of the participants and were used to study consumptive and non-consumptive orientations and attitudes about hunting. Specific attitudes were measured by items 23 through 47, and the three knowledge components were made up from questions 48 through 97. Questions 98 through 104 were used to examine selected demographic variables and knowledge.

Description of the Study Area and Study Population

Broward County, Florida, was selected as the study site because of the cosmopolitan nature of the population, a sizeable number of eighth graders were available, and excellent cooperation with the school system was assured. Broward County is located in southeastern Florida and is dominated by the city of Fort Lauderdale. The county has approximately 902,500 residents and is growing at a rate of 7% per year. The county has 25 public middle schools (grades 6, 7, and 8).

All teachers and students participating in the study were volunteers. A short study description was presented at a meeting of the Broward County Science Teachers Association and volunteers requested. Seventeen teachers volunteered, and fifteen actually participated in the study.

The school system required that all parents be notified that the testing program was taking place. A parental permission slip that briefly described the study and provided parents and students the option of not participating was given to each student. None of the cooperating teachers reported any students refusing to participate.

Data collected by the initial application of the

instrument were used to statistically describe the population. These data provide baseline information on the perceptions of eighth graders in Broward County. Baseline data were collected during the week of March 6, 1978, by the 15 cooperating teachers in seven middle schools representing a wide geographic distribution in the study area. Data analysis was done at the Florida State University's Computer Center using the Statistical Package for the Social Studies Program, Version 7.

CHAPTER IV

DATA ANALYSIS AND DISCUSSION

Data collected during the baseline study indicated that the scores on the three components of the knowledge test were not different enough to warrant separate analysis. The scores were all low, the students correctly answering 49% of the ecology questions, 41% of the animal questions, and 47% of the questions about endangered and threatened species. For the purpose of this study, knowledge of ecology, knowledge about animals and knowledge about endangered and threatened species were combined into a total knowledge score with a mean of 22.7 (46%) and a standard deviation of 6.7. The highest possible score was 49, and the range was from 1 to 42.

Formation of Subpopulations

The total knowledge scores were divided into three groups each representing about one-third of the sample. Persons with scores of 19 or below were assigned to the low group; persons with scores between 20 and 25 were assigned to the medium group; and persons with scores of 26 or above

were assigned to the high group.

Students were assigned to high, medium, and low groups based on the frequencies of their participation in animal-related activities. Divisions were made after examining baseline data, and persons with scores below 7 were assigned to the low group; persons with scores between 8 and 11 were assigned to the middle group, and those with scores of 12 or higher were assigned to the high group. Assignments were made so approximately one-third of the sample fell into each group.

Persons with consumptive orientations toward wildlife such as hunting and fishing for sport or for food (sport hunter, food hunter) and those persons who enjoy wildlife for non-consumptive orientations as watching and learning about wildlife were also studied. While these categories are not mutually exclusive, they are similar to those commonly used in the literature.

General Statistical Treatments

Several statistical techniques were used to analyze these data. Chi-square is a measure of association based on the differences between observed responses and the expected number of responses. If the agreement between the observed and expected response is close, chi-square will be small,

and the less likely it is that the observed frequencies did not come from the population on which the null hypothesis is based.

The contingency coefficient (C) is a measure of the strength of the association between two sets of attributes like knowledge and attitude. The larger the discrepancy between the observed responses and the expected responses, the larger the degree of association between the two variables and the higher the value of C.

Chi-square is a test of association, and C is an index of the degree of association and is a function of chi-square.

The sample size used in this study was 1,315. This was sufficiently large to select an alpha of .05, a power of .995, and an effect size of approximately .25 of the standard deviation (Cohen, 1969) for the chi-square tests.

Appendix 2 contains the chi-square values, probabilities, and the contingency coefficients for each attitude variable compared with knowledge. Statistics were computed at the Florida State University's Computer Center, using the Statistical Package for the Social Sciences Program, Version 7.

A small probability (.05 or less) indicates that variables are not independent. Table 1 identifies the number of significant associations discovered among the 25 attitude questions, and Table 2 summarizes the chi-square probabilities.

Table 1

The Number and Level of Significant Associations With the 25 Attitude Items

Variable	.05 or less N	.01 or less N
Knowledge level	16	15
Animal activities	18	14
Non-consumptive users	21	20
Food hunter	13	7
Sport hunter	15	12

Table 2

Probabilities Associated with Chi-Square Values When Comparing Knowledge Level, Level of Animal Activities, Consumptive and Non-Consumptive Orientations (Decimals Omitted)

Attitude item	Knowledge level	Animal activities	Non-consumptive	Food hunter	Sport hunter
23. More interested in pets	000[a]	000	000	009	120
24. Wildlife in better health	627	044	880	039	545
25. Interested in learning more	000	000	000	747	000
26. Most wildlife dangerous	000	000	020	044	003
27. Like to live near wildlife	000	000	000	005	090
28. Wrong to kill wildlife just to display it	580	329	000	000	000
29. Thoughts and feelings of animals different than humans	003	068	001	008	000
30. Don't like animals close	000	000	000	655	110
31. Instinct regulates animals	063	643	515	915	344
32. Stop hunting seals	000	000	000	015	000
33. Protect endangered species	000	000	000	085	110
34. O.K. to kill for medical needs	131	571	016	000	000

[a]A number of 050 or less indicates the variable was significantly different within the low, medium, and high groupings.

Table 2--continued

Attitude item	Knowledge level	Animal activities	Non-consumptive	Food hunter	Sport hunter
35. Do not protect farm predators	000	000	000	043	001
36. Eliminate animals that eat food crops	325	209	000	004	000
37. Eliminate unnatural zoos	000	023	001	026	000
38. Animals exist for people	000	023	003	035	049
39. Common animals are important	011	002	000	558	042
40. Give up eating meat if I had to kill it myself	007	326	480	000	000
41. Leave endangered species alone	227	165	242	900	947
42. O.K. to let small animals be extinct	000	000	000	464	048
43. Do not protect hawks and weasels	000	000	000	103	006
44. Flies and mosquitoes are important to nature's balance	000	000	000	304	089
45. Wild animals fall in love	680	018	007	264	558
46. Animals feel pain	000	004	000	328	007
47. Animals think about actions	020	009	004	611	102

Relationships Between Knowledge, Animal Activities, and Attitudes

The chi-square test attempted to determine if systematic relationships existed between knowledge and attitudes or if they were independent. The contingency coefficient measures the strength of the association between two variables. If the value of C is close to zero, there is little or no relationship between the two variables. Table 3 summarizes the contingency coefficients and chi-square probabilities for level of knowledge and level of animal activities. These data indicate there is not a strong relationship between attitude items and level of knowledge or level of animal activities. The results show that just 8 of the 25 items were associated with level of knowledge at a strength greater than C = .20, and only 5 attitudes were associated with animal activities at that level. The highest coefficient was C = .30.

There are some interesting attitudes that were not associated with knowledge levels. For example, there was no differences (chi-square = 4.37; df = 6; p = .627) among knowledge levels and how participants felt about the health of wildlife and pet animals. This indicates a lack of understanding about natural selection and predator-prey interactions.

Table 3

Attitude Items with Chi-Square Probabilities and Contingency Coefficients for Level of Knowledge and Level of Animal Activities (Decimals Omitted)

Attitude item		Knowledge		Activity	
		p	C	p	C
23.	More interested in pets	000	18	000	26
24.	Wildlife in better health	626	05	044	09
25.	Interested in learning more	000	23	000	29
26.	Most wildlife dangerous	000	24	000	18
27.	Like to live near wildlife	000	28	000	30
28.	Wrong to kill wildlife just to display it	580	05	328	07
29.	Thoughts and feelings of animals different than humans	000	12	068	09
30.	Don't like animals close	000	20	000	24
31.	Instinct regulates animals	065	09	642	05
32.	Stop hunting seals	000	14	000	14
33.	Protect endangered species	000	21	000	17
34.	O.K. to kill for medical needs	131	08	570	06
35.	Do not protect farm predators	000	16	000	18
36.	Eliminate animals that eat food crops	325	07	209	08
37.	Eliminate unnatural zoos	000	15	023	10
38.	Animals exist for people	000	14	023	10
39.	Common animals are important	011	11	002	12
40.	Give up eating meat if I had to kill it myself	007	11	326	07
41.	Leave endangered species alone	227	07	165	08

Table 3--continued

Attitude item	Knowledge		Activity	
	p	C	p	C
42. O.K. to let small animals be extinct	000	26	000	17
43. Do not protect hawks and weasels	000	29	000	20
44. Flies and mosquitoes are important to nature's balance	000	26	000	17
45. Wild animals fall in love	679	05	018	10
46. Animals feel pain	000	21	004	12
47. Animals think about actions	020	10	009	11

Question 45 asked if wild animals fall in love, and knowledge level was not significant (chi-square = 3.98; df = 6; p = .680) in determining how a person would respond. This indicates that anthropomorphic attitudes and perhaps personification of animals are prevalent in young people despite knowledge about wildlife. Protecting endangered species (question 33) was perceived as important by 91% of the population and had a relatively high association (chi-square = 60.80; df = 6; p = .000) with level of knowledge (C = .21), but question 41, exploring attitudes toward managing endangered species was not associated with level of knowledge (chi-square = 8.15; df = 6; p = .227). The contingency coefficient was C = .07. This indicates that while the young people want to preserve endangered species, they apparently view no management as the best management.

Knowledge was significant in predicting how people related to wildlife. Only 29% of the low knowledge group strongly disagreed with the statement, "Animals exist mainly for the benefit of people," but 41% of the high knowledge group strongly disagreed. Questions 42 and 44 explored attitudes toward lower forms of animal life, and there were significant differences between high and low knowledge groups. The more knowledgeable people strongly disagreed

(low = 24%; high = 44%) that it was all right to let small animals become extinct and strongly agreed (low = 28%; high = 44%) that even flies and mosquitoes are important. Questions 35 and 43 examined attitudes toward predators and, again, the more knowledgeable people had greater tolerances of predators than those persons in the low knowledge group (low = 24%; high = 40%). In fact, attitudes about protecting hawks and weasels showed the strongest relationship with knowledge of any of the items examined (C = .29).

The chi-square probabilities and contingency coefficients for animal activities (Table 3) closely parallel those for knowledge. Only questions 24, 29, 40, and 45 are different when the chi-square probabilities are compared, and in each case the contingency coefficient is very low for both the knowledge level and level of animal activities.

Pearsonian Correlation

Chi-square provides probabilities about independence or associations but does not examine the strength of the association. If the variables are linear, the Pearson product-moment correlation (r) is an appropriate measure of association. Pearson's r indicates the strength of the linear relationship between two variables. If the value of r is close to zero, there is little or no relationship

between the two variables. If the value of r approaches +1.0 or -1.0, there is a strong linear relationship.

Table 4 summarizes the Pearsonian correlations for this study. These data do not indicate the existence of any strong linear relationships between level of knowledge, level of animal activities, and attitudes. Results indicate that six attitudes were correlated with knowledge at a level higher than r = .20 and only four attitudes were correlated with animal activities at that level. If the r's are combined, only two attitudes have values higher than r = .50, and these deal with interest in learning about wildlife and living where wildlife is nearby. The Pearsonian correlations and the contingency coefficients have very similar values (Tables 3 and 4), indicating there may be some linear relationship between attitudes and knowledge scores.

Factor analysis. Factor analysis statistically combines similar variables and was used to examine attitude groupings in the three knowledge categories. The analysis was attempted using the principle factor with iterations for three, four, five, six, and eight factors. The number of attitudes identified by the analysis was greatly reduced after the fifth factor and the five varimax rotation was used for analysis. The varimax is an orthogonal rotation

Table 4

Pearson's Correlation Coefficient and Probabilities with Attitudes, Knowledge, and Animal Activities (Decimals Omitted)

		Knowledge		Activity	
		r	p	r	p
23.	More interested in pets	156	000	254	000
24.	Wildlife in better health	041	067	002	468
25.	Interested in learning more	222	000	273	000
26.	Most wildlife dangerous	245	000	177	000
27.	Like to live near wildlife	281	000	303	000
28.	Wrong to kill wildlife just to display it	026	172	040	071
29.	Thoughts and feelings of animals different than humans	108	000	085	001
30.	Don't like animals close	158	000	212	000
31.	Instinct regulates animals	079	002	006	415
32.	Stop hunting seals	134	000	097	000
33.	Protect endangered species	187	000	117	000
34.	O.K. to kill for medical needs	024	194	015	298
35.	Do not protect farm predators	156	000	150	000
36.	Eliminate animals that eat food crops	064	010	066	009
37.	Eliminate unnatural zoos	105	000	031	130
38.	Animals exist for people	009	000	071	005
39.	Common animals are important	087	000	092	000
40.	Give up eating meat if I had to kill it myself	075	003	044	056
41.	Leave endangered species alone	072	005	062	012
42.	O.K. to let small animals be extinct	250	000	162	000
43.	Do not protect hawks and weasels	256	000	180	000

Table 4--continued

		Knowledge		Activity	
		r	p	r	p
44.	Flies and mosquitoes are important to nature's balance	228	000	143	000
45.	Wild animals fall in love	004	440	100	000
46.	Animals feel pain	175	000	105	000
47.	Animals think about actions	057	020	103	000

which simplifies the columns of a factor matrix. This simplification is equivalent to maximizing the variance in each column. The analysis identifies the variables that belong together and are unrelated to other variables.

This analysis identified 16 attitudes characteristic of the low knowledge group, 15 that characterized the medium knowledge group, and 14 that characterized the high knowledge group. Because of the initial low correlations (chi-square and Pearsonian), few factors loaded at weights higher than .5 on any of the five factors. Therefore, factor analysis could give no indication of the attitude structure of the three knowledge groups.

Discriminant Analysis. Discriminant analysis weighs and combines variables so they are statistically forced to be as distinct as possible. A step-wise discriminate analysis attempts to determine which variables are the most powerful discriminators. Variables included consumptive and non-consumptive resource orientation, the animal activity score, each of the attitudes, and level of knowledge.

Criteria for inclusion in the step-wise discriminate analysis was established between $F = .010$ for inclusion and $F = .005$ for deletion. This procedure selects the variable

which will maximize the separation between groups and is simply a test for the amount of separation added by each variable in addition to the separation produced by each previously entered variable.

Analysis of 34 variables using 12 steps put only 51% of the attitudes into the correct level of knowledge category. The discriminant analysis did not show any of the attitudes were effective discriminators among knowledge levels. Random assignment of the variables would account for 33% of the variation.

Multiple Regression Analysis. Multiple regression analysis is a special case of discriminate analysis that indicates the degree of linear relationship between one dependent and a set of independent variables. A step-wise multiple regression analysis was selected to test the importance of attitudes and animal activity scores in explaining variance in knowledge.

Criteria for inclusion in the step-wise multiple regression analysis was established between $F = .010$ for inclusion and $F = .05$ to remove. This criteria was selected to maximize the differences between variables. The computer ordered 34 variables in 15 steps based on their relative importance in predicting knowledge. The variable that

explained the greatest amount of variance in the dependent variable (knowledge) was entered first and so on until the 15 steps were completed. This forward, step-wise inclusion orders the attitudes from best to worst. The value of r^2 gives the proportion of predictable variation in knowledge explained by the linear regression on each attitude item.

Score on the animal activities inventory was the best predictor of the 34 attitudes examined, but only explained 10% (r^2 = .100) of the variance in knowledge scores. Attitudes identified in the next 14 steps only explained an additional 11% of the variation. The step-wise multiple regression analysis failed to provide any evidence that variance in knowledge could be predicted by any attitude or combination of attitudes or by the animal activity score.

The Relationship Between Knowledge and Animal Activities

Table 5 compares knowledge levels and the level of animal activities. The association between knowledge and animal activities was significant (chi-square = 84.81; df = 4; p = .000); the contingency coefficient was .25.

The Pearsonian correlation for these data was r = .23, indicating some linear relationship exists between the knowledge scores and the frequency of animal activities.

Table 5

Percentage of Responses by Knowledge Level and Level of Animal Activities (N = 1,311)

Knowledge level		Level of animal activities			
		Low	Medium	High	Row
Low	Row	47	30	24	36
	Column	47	36	25	
Medium	Row	34	36	30	30
	Column	29	36	26	
High	Row	26	25	49	34
	Column	25	28	49	
Column		36	30	34	100

The Relationships Between Knowledge and Animal Activities with Consumptive and Non-Consumptive Orientations

Table 6 gives the percent response by knowledge level with the reasons for enjoying wildlife, and Table 7 provides the percent response by level of animal activities and the reasons for enjoying wildlife.

The responses to the section of the instrument identifying the reasons why wildlife was important are not

mutually exclusive; however, there appear to be differences between those who enjoy wildlife for consumptive purposes like hunting and fishing and those who enjoy wildlife for non-consumptive purposes like birdwatching.

Responses to non-consumptive questions like "enjoy watching wildlife" (chi-square = 55.50; df = 4; p = .000) and "enjoy learning about wildlife" (chi-square = 66.12; df = 4; p = .000) were significant when compared to levels of knowledge. Only 73% of the low knowledge group agreed they enjoyed watching wildlife, but 91% of the high knowledge group agreed (C = .20). Just 59% of the low knowledge group enjoyed learning about wildlife, but 88% of the high knowledge group agreed (C = .22).

Of the total population, 82% agreed they enjoyed watching wildlife, and 70% agreed they enjoyed learning about wildlife. Non-consumptive orientations toward wildlife characterized the majority of the population and these orientations are associated with knowledge levels. Of the high knowledge group, 42% had non-consumptive orientations and 36% had consumptive orientations. In the low knowledge group, 30% had non-consumptive and 40% had consumptive orientations.

Table 6

Percentage of Responses by Knowledge Level Group and the Reasons for Enjoying Wildlife (N = 1,315)

Level of knowledge	Agree	Disagree	Don't know
Enjoy watching wildlife (p = .000)			
Low	73	14	14
Medium	82	10	8
High	91	6	2
Column totals	82	10	8
Enjoy hunting and fishing for food (p = .021)			
Low	36	48	16
Medium	39	46	15
High	46	44	10
Column totals	40	46	14
Enjoy hunting and fishing for sport (p = .111)			
Low	42	42	16
Medium	40	49	12
High	41	49	10
Column totals	41	47	12
Enjoy learning about wildlife (p = .000)			
Low	59	24	17
Medium	66	19	15
High	88	9	8
Column totals	70	17	13

Relationships between knowledge level and consumptive uses are mixed. Enjoyment of hunting and fishing for food was significant (chi-square = 11.50; df = 4; p = .021), but enjoyment of hunting and fishing for sport was not significant (chi-square = 7.52; df = 4; p = .111) when compared to knowledge level. Enjoying hunting and fishing for food provided a contingency coefficient of just C = .09 and the strength of the relationship between knowledge level and hunting and fishing for sport was a weak C = .08. Of the total population, 40% indicated they enjoyed hunting and fishing. Consumptive orientations toward wildlife characterized a minority of the population, and it is unclear if these orientations are related to knowledge levels.

When consumptive and non-consumptive resource orientations are compared with levels of animal activities (Table 7) the differences become less pronounced; the chi-square probabilities are all significant. The contingency coefficients are much larger for non-consumptive orientations (C = .24 and .26) than for consumptive orientations (C = .16 and .10) indicating the strength of the relationship is greater for non-consumptive orientations and level of animal activities.

The percent of the population indicating they enjoyed

Table 7

Percentage of Responses by Level of Animal Activity and the Reasons for Enjoying Wildlife (N = 1,315)

Activity level	Agree	Disagree	Don't know
Enjoy watching wildlife (p = .000)			
Low	70	18	13
Medium	85	8	8
High	92	4	4
Column totals	82	10	8
Enjoy hunting and fishing for food (p = .000)			
Low	31	55	15
Medium	43	46	12
High	49	38	14
Column totals	40	46	14
Enjoy hunting and fishing for sport (p = .000)			
Low	34	52	14
Medium	45	45	10
High	45	43	12
Column totals	41	47	12
Enjoy learning about wildlife (p = .000)			
Low	56	30	14
Medium	41	14	15
High	82	8	10
Column totals	70	17	13

a particular activity was the same for activity levels and for knowledge levels. This reinforces the finding that knowledge and animal activities are closely related.

Only 10% of the young people agreed with the statement that "wildlife is not important." Knowledge was significantly associated with this attitude (chi-square = 46.10; df = 4; p = .000). Only 8% of the high knowledge group felt wildlife was not important, and 3% of the low knowledge group shared this view; the contingency coefficient was C = .20.

The Relationship Between Knowledge and Attitudes Toward Hunting

Table 8 summarizes the percentages of responses by knowledge level group with attitudes toward hunting and provides the chi-square probabilities. Of the total population, 69% felt hunting for fun was wrong; 77% of the high knowledge group and 62% of the low knowledge group shared this view. The differences among knowledge levels were significant (chi-square = 28.08; df = 4; p = .000); the contingency coefficient was C = .18. This answer is consistent with the responses to attitude question 28, "It seems wrong to kill a wild animal just to put it on display in someone's house," where 73% of the total population

Table 8

Percentage of Responses by Knowledge Level Group and Attitudes Towards Hunting (N = 1,315)

Level of knowledge	Agree	Disagree	Don't know
Hunting for fun is OK (p = .000)			
Low	29	62	9
Medium	24	70	6
High	18	77	5
Column totals	24	69	7
Hunting for food is OK (p = .000)			
Low	52	31	17
Medium	59	32	10
High	74	19	6
Column totals	62	27	11
It is OK for others to hunt (p = .313)			
Low	39	45	16
Medium	41	46	13
High	43	46	12
Column totals	41	45	13
Hunting should be against the law (p = .000)			
Low	35	47	18
Medium	28	59	14
High	23	62	15
Column totals	29	56	16

strongly agreed that it is wrong to kill animals for sport.

Attitudes toward hunting for food were quite different. Of the total population, 62% agreed that "hunting for food is OK;" 74% of the high knowledge group and 52% of the low knowledge group shared this view. The differences among knowledge levels were significant (chi-square = 61.22; df = 4; p = .000); the contingency coefficient was .21. This suggests that young people may perceive wildlife as part of a predator-prey relationship with humankind but largely reject the notion of using wildlife for just recreational purposes.

Attitudes towards other people hunting were about evenly split with 41% agreeing and 45% disagreeing that "It is OK for others to hunt." There were no significant differences among knowledge levels and the responses (chi-square = 4.76; df = 4; p = .313); the contingency coefficient was C = .06. These attitudes present an interesting contrast to the responses to the question, "I think all hunting should be against the law." Of the total population, 29% agreed that all hunting should be outlawed, 56% disagreed, and 16% were undecided. Differences among knowledge groups were significant (chi-square = 24.09; df = 4; p = .000); the contingency coefficient was C = .13.

Of the high knowledge group, only 23% agreed; 35% of the low knowledge group agreed. Reasons for the differences in the responses to these questions are unclear, but the relatively weak associations with knowledge level indicates that factors other than knowledge are apparently responsible.

Demographic Variables and Knowledge

Age of the study participants and knowledge were not significantly associated (chi-square = 15.26; df = 8; p = .060). Almost 91% of the participants were between the ages of 13 and 15 years, and all in the eighth grade.

Sex and knowledge were significantly associated (chi-square = 68.98; df = 2; p = .000). Forty-six percent of the males and 24% of the females fell in the high knowledge category, while only 25% of the males and 40% of the females were in the low knowledge group.

Race and knowledge were also significantly associated (chi-square = 67.34; df = 8; p = .000). The largest difference was between blacks and whites. Whites made up 79% of the tested population and 39% scored in the high knowledge group. Blacks represented 17% of the test population but only 17% scored in the high knowledge category. Differences in the low knowledge level are even more pronounced, with 29% of the whites and 54% of the blacks

assigned to this grouping. Spaniards, American Indians, and Orientals make up the remaining 4% of the sample but are too infrequent to make analysis meaningful.

Knowledge and the education of the young people's parents were significantly related (father's education: chi-square = 33.85; mother's education: chi-square = 46.32; df = 8; p = .000). Forty-two percent of the children of college graduates were in the high knowledge group; 33% of the children of high school graduates were in the high knowledge group; and 29% of the children of non-high school graduates were in the high knowledge group.

The low knowledge level contained 28% of the children of college graduates, 30% of the children of high school graduates, and 33% of the children whose parents did not complete high school. Participation in animal-related activities was not related to parental education (father's education: chi-square = 9.04; df = 8; p = .338, and mother's education: chi-square = 2.75; df = 8; p = .949).

Residence (urban-suburban-rural) and knowledge may have a significant association (chi-square = 11.07; df = 4; p = .026), but only 4% (N = 49) of the population identified themselves as rural. Geographically, a large percentage of Broward County is sparsely settled, and the population is

concentrated on a very small percentage of the total land area. In fact, rural areas may well be populated by urban refugees accounting, in part, for the lack of rural persons in the sample.

Parental association with an animal or wildlife oriented organization and knowledge was not a significant association (chi-square = 15.87; df = 10; $\underline{p}$ = .103). Again, this could be due to the relatively small number ($\underline{N}$ = 182) that indicated their parents belonged to an animal-oriented organization.

CHAPTER V

THE EFFECT OF INCREASING KNOWLEDGE

Description of the Treatments

One component of this research involved the evaluation of increasing learner knowledge about wildlife and ecology. Four treatments were used as interventions to increase student knowledge.

Treatment 1 was a filmstrip entitled The World of Endangered Wildlife and developed by the National Wildlife Federation, 1412 16th Street, Washington, D.C., 20036. The filmstrip is accompanied by a sound recording on cassette tape, with a showing time of approximately 22 minutes. The package included a teacher's guide, reference copies of endangered species materials, and a list of endangered and threatened species in the United States. This National Wildlife Federation (NWF) treatment was shown by cooperating teachers. Discussion following the presentation filled the remaining part of the 50-minute period. Students were posttested the next day.

Treatment 2 was Man and Wildlife, a filmstrip about

the past, present, and future of wildlife in the United States. It was produced by the National Shooting Sports Foundation, Inc., 1075 Post Road, Riverside, Connecticut, 06878, and contains three filmstrip and cassette tape programs as well as a teacher's guide. The programs are: (a) "Wildlife Management," an 11-minute presentation dealing with the scientific principles and practices of wildlife conservation; (b) "Endangered Species," a 12-minute presentation dealing with past and present factors involved in the decline and disappearance of certain animals; and (c) "Man--The Hunter," an 11-minute presentation exploring the anthropological implications of hunting as a modern management tool.

The National Shooting Sports Foundation (NSSF) treatment involved the sequential presentation of each filmstrip with the cassette tape and discussion the end of the class period for each program. Students were posttested at the end of the three-day treatment.

Treatment 3 was a combination of Treatments 1 and 2 and lasted four days.

Treatment 4 involved a three-day, two-night field trip in the Everglades. While strict controls on the field trip were beyond the scope of this study, pretest data was

available on the field trip participants. Students were then posttested to measure both knowledge gains and to examine possible shifts in attitudes that may have resulted from the field trip.

Table 9 provides the treatment design. Treatment assignments were randomly made to the teacher's class with the exception of Treatment 4, the field trip. This learning experience was beyond the control of the research project; this particular class had chosen the Everglades field trip as part of an overall class unit on Florida.

Three schools were asked to participate in the experimental phase designed to increase knowledge. Schools were selected because of their similar knowledge scores obtained during the baseline studies and because the teachers had expressed a willingness to provide further assistance. One school was unable to participate because the treatment period corresponded to another testing program with which the school was involved. The remaining schools each had one cooperating teacher. All treatments occurred between April 12 and April 20, 1978.

A three-group design was used to evaluate the effectiveness of each treatment. Group 1 was the full experimental group receiving a pretest, a treatment, and a posttest.

Table 9

Treatment Design for the Experimental Phase of the Study

School	Class period				
	1	2	3	4	5
School A					
Day 1	NWF[a]	NWF	NSSF[b]	Field trip	C[c] Test
Day 2	NSSF	Test	NSSF	Test	
Day 3	NSSF		NSSF Test		
Day 4	NSSF Test				
School B					
Day 1		NSSF	NWF	C Test	C Test
Day 2		NSSF	Test		
Day 3		NSSF Test			

[a]NWF is the treatment distributed by the National Wildlife Federation.

[b]NSSF is the treatment distributed by the National Sport Shooting Foundation, Inc.

[c]C represents control groups.

Group 2 served as a control and was given the pre- and post-tests without the treatment. Finally, Group 3 was a special control group used to test whether the maturation of the students over the course of the treatment period was a factor in knowledge development.

Treatment Results

The treatments designed to increase learner knowledge produced slight knowledge increases, but the increases are not statistically significant when compared to the pre-post control group. This could be the residual effect of the test itself or because the control group participated in classroom activities involving ecology and wildlife. Table 10 summarizes the changes in knowledge scores that occurred between pre- and posttesting. The large differences in treatment effects between schools reflects teacher influences.

Because all treatment groups exhibited some positive increases in knowledge, they were combined into an experimental group. Table 11 summarizes the combined treatment data including the control groups on total knowledge scores.

The experimental classes and the control groups were compared to test the equality of the means of the total knowledge scores. Analysis of variance tests whether

Table 10

Changes in Total Knowledge Scores Between the Pre- and Posttests by Treatment and School

Treatment	School A	School B
1 NSSF[a]	0.00	5.77
2 NWF[b]	2.62	7.75
3 NWF + NSSF	2.37	N/A
4 Field Trip	4.80	N/A
5 Control	2.11	N/A

[a]NSSF is the treatment distributed by the National Sport Shooting Foundation, Inc.

[b]NWF is the treatment distributed by the National Wildlife Federation.

Table 11

Summary of the Combined Treatment Data Including the Control Groups on Total Knowledge Scores

Treatment		Number	Mean	Standard Deviation
0	Pretest	163	24.9	5.7
1	NSSF[a]	50	25.8	8.3
2	NWF[b]	54	30.1	6.4
3	NWF + NSSF	24	25.5	7.6
4	Field trip	13	32.2	5.6
5	Pre-Post Control	21	29.1	5.0
6	Post Control	62	24.9	5.8

[a]NSSF is the treatment distributed by the National Sport Shooting Foundation, Inc.

[b]NWF is the treatment distributed by the National Wildlife Federation.

several samples have come from identical populations and served as an omnibus test of the significance of the knowledge increases. The test results indicated there was no significant differences among the means. Table 12 provides the results of the analysis of variance. Because the treatments did not demonstrate any significant knowledge increases, the effects of increasing knowledge on attitudes could not be examined.

Table 12

Analysis of Variance

	Sum of squares	Degrees of freedom	Mean square
Category means	46	9	9.24
Within	4538	239	19.19
Total	4585	244	

CHAPTER VI

DISCUSSIONS AND CONCLUSIONS

Limitations of the Study

This study examined knowledge about ecology, animals, and endangered and threatened species and its relationship to certain variables. A specific population was examined: eighth grade students in an urban South Florida county. The findings reflect this particular population and generalization to other school districts should be done with caution. Because the population was homogeneous for age and grade level, it is important that these data not be used to characterize older or younger students. These factors were not examined by this research.

Like any computer-assisted research, this study generated an abundance of data and statistical tests. Data that are significant in the statistical sense tend to highlight such studies; data that are merely interesting are often ignored. I have attempted to include the relevant data in light of the objectives of this study.

The findings are divided into two sections; the first presents the results of the statistical tests, and the second gives a discussion of these findings.

General Findings

A. There is a significant association among levels of knowledge, levels of animal-related activities and attitudes.

B. There is a significant association among levels of knowledge, level of animal-related activities and non-consumptive resource orientations.

C. There is a significant association among levels of knowledge and attitudes toward hunting.

D. Some demographic variables are significantly associated with levels of knowledge as measured by the test instrument used in this study.

E. There is a significant association between levels of knowledge and levels of animal-related activities.

F. The learner intervention products used in this research did not result in any knowledge increases.

Discussion

A. Knowledge and attitudes are related components of environmental perception but apparently have little influence on each other. Knowledge level was significant in 16 out of 25 attitude variables, but the index of association never exceeded $\underline{C} = .30$. This finding supports Kellert (1977), who found significant relationships among attitudes and knowledge in adults.

B. Attitude orientations concerning consumptive and non-consumptive uses of wildlife appear to be well developed by the time young people reach eighth grade. It is clear that non-consumptive users of wildlife greatly outnumber consumptive users and are more knowledgeable. This does not support the finding of McDonough (1975) or Pomerantz (1977), who both concluded that hunters tend to be better informed about wildlife than other groups. Kellert (1977) distinguished between the types of hunters and found that sport hunters were among the lowest knowledge group, but nature hunters were the highest group.

The data from this study indicate that knowledge is associated more with activities like watching TV programs about wildlife and hiking to look for wildlife than participating in consumptive activities like hunting and fishing.

C. Attitudes toward hunting and knowledge level are significantly related. Of the total population, 69% were opposed to hunting for fun and the index of association with knowledge was $\underline{C}$ = .18. Sixty-two percent of the population supported the notion of hunting for food; the index of association with knowledge was $\underline{C}$ = .21. The more knowledgeable young people were opposed to outlawing hunting, but the reasons for this are unclear. Of the total population, 45% were opposed to others hunting, but only 29% felt hunting should be outlawed. Significantly more of the high knowledge group were opposed to outlawing hunting than the young people in the low knowledge group. The index of association with knowledge level was $\underline{C}$ = .13.

D. Some demographic factors were significantly associated with level of knowledge. Sex, race, and parental education were all significantly associated with knowledge. This finding supports Kellert's (1976) conclusion that sex, race, and education are significant predictors of knowledge level.

Urban-rural-suburban differences are significantly associated (chi-square = 11.07; df = 4; $\underline{p}$ = .026), but the number of rural participants ($\underline{N}$ = 49) was low.

E. Participation in animal-related activities showed the highest association ($\underline{C}$ = .25) with knowledge of any of the variables examined. Level of participation in animal-related activities was associated with 18 of the 25 attitude variables, but the strength of the associations was low and never exceeded $\underline{C}$ = .30.

F. The association between increasing knowledge and attitudes remains elusive because of sampling problems and the limited effect of the treatments. The pre-post control group showed small increases in knowledge obscuring the effects of the learner intervention products with the effects of the test.

The effect of knowledge increases on environmental attitudes merits more consideration in further, well-controlled research. Longer treatments will probably be necessary to increase knowledge enough for meaningful analysis. It appears that field studies should be an important part of these treatments.

Testing the Model

Examining the results in terms of the conceptual scheme of environmental perception identified in Figure 1 demonstrates the usefulness of the model. While most of this research involved the individual and the cognitive-affective-psychomotor systems, it also demonstrated the utility of the model when attempting to produce change. Stimuli, in the form of treatments, demonstrated some effect on the individual. It was beyond the scope of this research to examine the effects of these changes on decision making and environmental behaviors, but the model provides the pathways and reference points to measure these effects.

Within the domain of the individual, this research was able to demonstrate that relationships do exist. The strength of the relationships as measured by the contingency coefficient indicates other factors are operational and that the cause-effect nature of the interrelationships needs additional exploration.

Figure 1 demonstrates a general model enabling researchers to study environmental perception in a holistic manner or to reduce perception to elemental components. The utility of the model, as demonstrated by this research,

is its quality of synthesis. Diverse areas of environmental perception were examined and the model enabled synthesis of the components to occur in a reasonable and logical manner. Application of the model to other kinds of perceptual research may suggest modifications for specific problems; however, the general model provides a meaningful schemata for research and discussion.

Management Implications

Data from this study clearly demonstrates a relationship between knowledge and attitudes and indicates that programs designed to increase knowledge about wildlife and endangered and threatened species should include abundant examples of humankind having positive interactions with animals (managing habitats; protecting specific species).

Differences in level of knowledge and attitudes toward wildlife and endangered and threatened species were partially obscured by other factors, including demographic variables. It may be necessary to design learner intervention programs aimed at specific targets (blacks; women) to maximize effectiveness. This is true for resource management agencies and the formal educational sector.

Animal activities impact attitudes as much as knowledge, and this supports encouraging wildlife-oriented

activities like camping, bird watching, and hunting and fishing as a means of educating young people. The relatively high association between knowledge and animal activities indicates an abundance of cross-links resulting from their interdependency.

Attitudes toward consumptive and non-consumptive uses of wildlife appear to be well formed by the time young people reach the eighth grade. This implies that programs designed to increase tolerance toward consumptive uses of wildlife should probably be directed at younger children. While attitudes toward hunting were not an important part of this study, understanding hunting as a management tool is critical to an overall understanding of wildlife management. This study found that young people with consumptive attitudes were less knowledgeable than those with non-consumptive attitudes. While there is some evidence to indicate that this difference is reduced in adult populations, there appears to be a specific need for educational programs aimed at young hunters and fishermen.

The lack of knowledge gains in the experimental groups indicate that neither commercial treatment was particularly effective. Certainly the length of the treatments was a factor and points to the futility of short,

one-day, slide-tape presentations without teacher preparation and follow-up. This is especially true when comparing the four day, in-class treatment with the two-day field trip. The field trip produced the largest knowledge gains of any of the treatments. Systematic treatments designed to influence both cognitive and affective systems, like intensive field trips, appear to be effective producers of knowledge. This supports the notion that educational programs should include a diversity of classroom strategies as well as field experiences.

Suggestions for Future Research

There is an immediate need for longitudinal studies to determine when environmental attitudes are formed and if they are modified as a child moves through the educational process. Kellert (1977) found knowledge to be significantly related to attitudes in adults but did not report the strength of the associations. This research found there were significant relationships in eighth graders. What is the strength of the relationships between attitudes and knowledge in a population of fifth graders or eleventh graders or adults?

Attitude orientations like consumptive and non-consumptive uses of wildlife, knowledge, and environmental

attitudes need to be more carefully examined. These attitudes are clearly developed by eighth grade. When do they develop? What are major influences on a particular orientation? Does knowledge play a significant role or does an early experience stimulate a particular attitude orientation?

The urban-rural variable needs closer examination. The results of this study indicate that there are significant differences in knowledge between urban-suburban and rural eighth graders, but the small sample of rural students leaves considerable doubt about the validity of the relationship. This study should be repeated in a rural county to see if these apparent differences are real.

The study results indicate a need to explore further the rela^ionship of demographic variables like sex and race on environmental perception. Additional studies should concentrate on the reasons for the knowledge differences between sexes and between blacks and whites. Cultural factors not considered by this research are apprently responsible for these differences, and they should be identified.

Why do non-consumptive activities show more association with knowledge than consumptive activities? What is the relationship between participation in animal activities

and attitudes in other populations? Are some activities more important in attitude development and knowledge level than others? As children get older, they participate in different activities. What effect does this have on knowledge and attitudes?

The literature and this research identify associations among variables like knowledge, environmental attitudes and participation in animal activities. This study has found that the associations, while significant, tend to be low. Environmental educators concerned with perceptions about wildlife and endangered species should design experiences that include a diversity of activities to impact both affective and cognitive systems.

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APPENDIX 1

The research instrument with the response percentages and the correct answers to the knowledge portion of the test. Approximately 1,315 eighth graders answered each question; the number of responses varies slightly due to omissions.

Appendix 1

	NEVER	1-3 TIMES	4 OR MORE TIMES
Did you do any of these things this past year?			
1. Have wild animals as pets	66.1	26.9	7.0
2. Play with wild animals at a zoo or museum	61.1	31.9	7.0
3. Watch a TV program about wildlife	5.5	28.8	65.7
4. Read books about wildlife	27.0	47.9	25.1
5. Go to see a movie about wildlife	45.7	43.2	11.1
6. Try to take a picture of wildlife	36.0	34.5	29.5
7. Have books about wildlife	23.6	39.4	37.0
8. Go fishing	22.0	25.7	52.4
9. Go hunting	72.6	14.9	12.5
10. Feed wildlife	29.8	37.7	32.5
11. Go for a hike to look for wildlife	47.9	32.7	19.4
How often did either of your parents:			
12. Go hunting this past year?	80.7	10.9	8.4
13. Go fishing this past year?	36.3	28.0	35.7

	AGREE	DISAGREE	DON'T KNOW
Why is wildlife important to you?			
14. I enjoy watching wildlife	81.7	10.0	8.3
15. I enjoy learning about wildlife	69.5	17.3	13.2
16. I enjoy hunting and fishing for food	40.4	46.1	13.5
17. I enjoy hunting and fishing for sport	41.0	46.6	12.4
18. Wildlife is not important to me	10.4	80.2	9.4
How do you feel about hunting animals?			
19. I think hunting for fun is O.K.	23.7	69.3	7.1
20. I think hunting for food is O.K.	61.6	27.2	11.3
21. I think it is O.K. for other people to hunt	40.9	45.4	13.8
22. I think all hunting should be against the law	28.6	55.7	15.6

	STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
23. I am more interested in pet animals than wild animals	27.8	41.8	23.1	7.3

		STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
24.	Wild animals are generally in better health than pet animals	13.4	27.0	38.6	20.9
25.	I am interested in studying and learning about animals	41.3	36.6	13.8	8.2
26.	Most wild animals are dangerous to me	18.0	27.4	22.6	32.0
27.	I would like to live in a place where there are lots of wild animals nearby	38.1	28.0	16.1	17.8
28.	It seems wrong to kill a wild animal just to put it on display in someone's house	73.7	10.4	5.5	10.4
29.	The thought and feelings of most animals are completely different from humans	20.6	28.7	27.9	22.8
30.	I don't like having animals close to me	5.4	8.4	14.4	71.7
31.	Almost everything animals do is dictated by instinct	35.9	36.0	20.4	7.7

		STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
32.	Hunting seals for their skins should be stopped	75.5	12.1	5.9	6.5
33.	An endangered species must be protected even at the expense of commercial activity	74.3	16.9	4.8	4.0
34.	It is all right to kill animals for the purpose of medical investigation	19.3	43.6	19.7	17.3
35.	Animals like coyotes and foxes should not be protected when they kill farm animals	13.4	25.5	30.3	30.9
36.	Animals that eat food crops, like rats, should be eliminated	25.8	28.4	25.9	19.8
37.	Zoos that don't provide a natural habitat for animals should be eliminated	48.6	27.9	13.3	10.2
38.	Animals exist mainly for the benefit of people	16.0	24.2	19.9	39.8

		STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
39.	The life of the most common animal is just as important as a family pet or an endangered species	62.1	25.1	8.9	3.9
40.	If I had to kill animals myself, I would probably give up eating meat	34.0	23.0	19.6	23.4
41.	If endangered animals are left alone, they will be all right	36.3	30.2	17.8	15.7
42.	It is all right to let small animals like snails and insects become extinct	7.3	16.1	22.9	53.7
43.	Animals that eat other animals, like hawks and weasels, should not be protected	11.4	13.2	21.3	54.1
44.	Even flies and mosquitoes are important in the balance of nature	59.4	23.0	9.4	7.1
45.	Wild animals fall in love	41.1	37.3	12.5	9.1

		STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
46.	Animals, like fish and rabbits, feel pain	71.4	17.4	6.3	4.9
47.	Animals think about their actions	32.8	38.1	20.5	8.6
			TRUE	FALSE	DON'T KNOW
48.	Forest fires are always bad for wildlife		79.1	<u>15.2</u>	5.7
49.	The carrying capacity is the ability of the land to support a certain number of animals		<u>47.8</u>	14.9	37.3
50.	Everything a person does has an effect on the environment		<u>60.5</u>	28.7	10.8
51.	Air pollution does not affect plants		8.5	<u>85.9</u>	5.6
52.	Intolerant trees are the first trees which appear in forest succession		<u>20.2</u>	20.3	59.5
53.	Loss of habitat does not affect animal populations		11.3	<u>76.4</u>	12.2
54.	Species with high-breeding rates have low death rates		22.0	<u>38.9</u>	39.2
55.	Insects are pests and have no purpose		13.1	<u>78.3</u>	8.6

<u>Note</u>: Correct answers are underlined.

		TRUE	FALSE	DON'T KNOW
56.	Killing the annual surplus of wildlife through hunting is currently a part of wildlife management	34.0	34.1	31.9
57.	Wildlife is a renewable resource	28.5	51.5	20.0
58.	An increase of one species has no effect on another species in the same area	17.3	68.7	13.9
59.	All food chains begin with the sun and green plants	64.7	18.9	16.4
60.	Energy can be recycled through an eco-system	35.2	17.4	47.4
61.	Transpiration is the process by which plants obtain water from the soil	34.0	17.0	49.0
62.	Most environmental problems are related to the rapid growth of human populations	69.5	14.6	15.9
63.	Snakes are covered with a thin layer of slime so they can move easily	34.9	46.5	18.4
64.	Deer eat mostly small rodents like mice	14.4	59.0	26.1
65.	A bird is the only animal that has feathers	49.3	39.9	10.3
66.	A female fox is a vixen	28.8	21.7	49.2

		TRUE	FALSE	DON'T KNOW
67.	Deer do not shed their antlers	34.8	41.9	23.2
*68.	A dolphin is a mammal, not a fish	83.2	10.7	6.2
69.	The blue whale is the largest animal the world has ever known	48.7	33.0	18.2
70.	A canvasback is a kind of insect	13.1	24.8	62.0
71.	The koala bear and opossum are both marsupials	27.1	14.8	57.8
72.	All fish lay eggs to reproduce	49.9	36.4	13.7
73.	Peccaries are wild pigs of South America	21.3	16.6	62.2
74.	Bats can see in the dark because of their specially-developed eyesight	55.4	37.6	7.1
75.	There are snakes in all 50 of the United States	56.5	21.9	21.7
76.	The world's largest snake is the python	46.6	22.6	30.8
77.	Drake is the name for a male duck	39.4	18.6	42.1
78.	A penguin is not really a bird	35.4	46.6	18.1
79.	The largest member of the deer family is the moose	68.5	11.5	20.0

*Question not included in analysis.

		TRUE	FALSE	DON'T KNOW
80.	Wolves usually mate for life	38.0	22.3	39.6
81.	Beavers and rats are rodents	48.0	30.2	21.8
82.	Platypuses are the only mammals to lay eggs	30.5	34.2	35.3
83.	Only birds and mammals are endangered	10.2	76.1	13.8
84.	Panthers eat mostly berries and grass	9.5	63.9	26.6
85.	Crocodiles and alligators live only in fresh water	40.6	45.2	14.2
86.	A manatee is a kind of fish	25.2	44.6	30.2
87.	Woodstorks are endangered because people hunt them	26.2	24.7	49.1
88.	The Everglades Kite eats mice and other rodents	33.6	19.6	46.8
89.	Wolves were never found in Florida	20.5	46.9	32.7
90.	Because the Bald Eagle nests in Florida, it is not endangered	8.8	77.5	13.8
91.	Sandhill cranes live on Florida's wet prairies year round	31.9	18.1	50.0
92.	Loss of habitat is a major threat to Florida's black bears	49.3	16.3	34.6

		TRUE	FALSE	DON'T KNOW
93.	Pelicans are threatened because they are not able to catch as many fish as before	27.5	46.3	26.2
94.	Alligators that live in wild areas benefit many other kinds of animals	56.0	21.2	22.8
95.	Endangered and threatened species of wildlife perform important functions in each community	55.5	16.8	27.8
96.	Changes in an animal's habitat may cause that animal to become an endangered species	73.6	12.1	14.2
97.	Whales are endangered because too many of them are killed for commercial uses like whale oil and dog food	73.0	13.7	13.3

98. My age is:
12 - 5.3
13 - 63.6
14 - 29.0
15 - 1.5
16 - .6

99. My sex is:
Male 48.9
Female - 51.1

100. My race is:
Caucasian (white) - 78.8
Negro (black) - 17.4
Spanish - 1.3
American Indian - 1.4
Oriental - 1.0

101. My father's education includes:

some high school	- 8.3
high school graduate	- 20.3
some college	- 11.4
college graduate	- 35.4
don't know	- 24.6

102. My mother's education includes:

some high school	- 7.8
high school graduate	- 32.6
some college	- 15.7
college graduate	- 26.7
don't know	- 17.2

103. I or a member of my family belong to:

a hunting club	- 3.2
a fishing club	- 4.3
a conservation club	- 4.3
the humane society	- 2.9
none of these	- 74.9
don't know	- 10.3

104. I live in a:

city	- 45.6
rural (farming) area	- 4.0
suburban area	- 50.4

APPENDIX 2

Table A: Correlations Among Levels of Knowledge and Attitude Variables.

Table A

Correlations Among Levels of Knowledge and Attitude Variables

Variable		Chi-square value	p	Contingency coefficient (C)
	Why is wildlife important to you?			
14.	I enjoy watching wildlife	55.50	.000	.20
15.	I enjoy hunting and fishing for food	11.50	.021	.09
16.	I enjoy hunting and fishing for sport	7.51	.111	.08
17.	I enjoy learning about wildlife	66.12	.000	.22
18.	Wildlife is not important to me	46.10	.000	.20
	How do you feel about hunting animals?			
19.	I think hunting for fun is O.K.	25.08	.000	.18
20.	I think hunting for food is O.K.	61.22	.000	.21
21.	I think it is O.K. for other people to hunt	4.76	.312	.06
22.	I think all hunting should be against the law	24.09	.000	.13
	Attitudes about animals and wildlife			
23.	I am more interested in pet animals than wild animals	47.07	.000	.18

Table A--continued

Variable	Chi-square value	p	Contingency coefficient (C)
Attitudes about animals and wildlife--continued			
24. Wild animals are generally in better health than pet animals	4.37	.626	.05
25. I am interested in studying and learning about animals	77.65	.000	.23
26. Most wild animals are dangerous to man	84.48	.000	.24
27. I would like to live in a place where there are lots of wild animals nearby	109.60	.000	.28
28. It seems wrong to kill a wild animal just to put it on display in someone's house	4.72	.580	.05
29. The thought and feelings of most animals are completely different from humans	19.82	.003	.12
30. I don't like having animals close to me	54.52	.000	.20
31. Almost everything animals do is dictated by instinct	11.93	.063	.09
32. Hunting seals for their skins should be stopped	27.21	.000	.14
33. An endangered species must be protected even at the expense of commercial activity	60.80	.000	.21
34. It is all right to kill animals for the purpose of medical investigation	9.84	.131	.08

Table A--continued

Variable	Chi-square value	p	Contingency coefficient (C)
Attitudes about animals and wildlife--continued			
35. Animals like coyotes and foxes should not be protected when they kill farm animals	38.05	.000	.16
36. Animals that eat food crops, like rats, should be eliminated	6.96	.325	.07
37. Zoos that don't provide a natural habitat for animals should be eliminated	32.44	.000	.15
38. Animals exist mainly for the benefit of people	27.93	.000	.14
39. The life of the most common animal is just as important as a family pet or an endangered species	16.56	.011	.11
40. If I had to kill animals myself, I would probably give up eating meat	17.69	.007	.11
41. If endangered animals are left alone, they will be all right	8.15	.227	.07
42. It is all right to let small animals like snails and insects become extinct	97.92	.000	.26
43. Animals that eat other animals like hawks and weasels should not be protected	118.29	.000	.29

Table A--continued

Variable	Chi-square value	p	Contingency coefficient (C)
Attitudes about animals and wildlife--continued			
44. Even flies and mosquitoes are important in the balance of nature	96.61	.000	.26
45. Wild animals fall in love	3.98	.680	.05
46. Animals like fish and rabbits feel pain	61.84	.000	.21
47. Animals think about their actions	15.03	.020	.10

Note. Questions 14 through 22; df = 4

Questions 23 through 47; df = 6.

VITA

Dr. David E. LaHart received his Bachelor of Science degree in wildlife science from Cornell University, Ithaca, New York, in 1968. He obtained a Master of Science in Forestry degree in wildlife ecology from the University of Florida, Gainesville, in 1970. LaHart's Master's research involved investigating the ecology and population parameters of the Florida duck.

He entered the graduate program in biological sciences at The Florida State University, Tallahassee, in September, 1971, transferred to the College of Education in 1972, and received a Master of Science degree in science education in June, 1973. He joined the faculty as a research associate with the college's Environmental Education Project, working with community leaders and teaching both elementary and secondary science methods courses to pre-service teachers. LaHart's Doctoral dissertation examined the role of knowledge on young people's perceptions about wildlife.

Professional accomplishments include election to the Board of Directors of the Florida Chapter of The Wildlife Society and the Florida Wildlife Federation. LaHart was appointed to the Endangered and Threatened Species Advisory Council, the Ad Hoc Advisory Committee for the Restoration of the Kissimmee River Valley, and Florida's Energy Education Advisory Council.

He has published over 50 technical and popular articles and serves as a consulting editor to the Journal of Environmental Education.